amyl in angina pectoris, a therapeutic discovery which has been attributed to others.

The enthusiasm for humanity which dictated so many of these researches, led Richardson to the front of the battle in the causes of preventive medicine and of teetotalism. His splendid services in the field of sanitary reform are too well known to need record in these columns; his determined advocacy of total abstinence, no doubt, as he tells us, to his own pecuniary detriment, sprang again from his ardent humanity. Whether, right or wrong, he was as a lion in his aweless championship of all measures which, in his opinion concerned the well-being of the masses. At the same time, his report of the social ignominy which overtook those who advocated this unpopular cause, seems to us exaggerated. Higginbottom, of Nottingham, may, of course, have strode down the room at the Provincial Medical Association unregarded and even shunned of men; but the present writer well remembers the honour in which Higginbottom was held by his contemporaries in spite of his determined opposition to the use of alcohol; and the writer, who also enjoyed the friendship of other prominent teetotallers, such as Edward Baines, never heard worse words spoken against these blameless men than that they were the victims of a troublesome whim. In practice the public not unnaturally fight shy of a faddist, as they supposed the teetotaller to be; but, except in the society of topers, surely no teetotaller as such was ever shunned. Sir Benjamin's nephelococcygian dream of the ideal City of Health made a great effect upon the audience to whom the address was given. The earnest purpose and the fervent desire of the orator to benefit mankind gave a reality to a scheme which, of course, he put forward more or less as a phantasy.

In dwelling on the life of Sir Benjamin Richardson we are led to wonder how it was that a man so earnest, so able, so fertile in speculation, so ardent in his laboratory researches should have achieved comparatively little of permanent scientific value. On the other hand, we shall not forget that much of his energy was given to inspiring and directing the men of his time in social work which, if it cannot be formulated, was none the less permanent in its effects. We have hinted that the speculative part of the volume before us is less interesting than the narrative: the thoughts are turned out upon paper in a crude state, and, generally speaking, are no more than the floating thoughts of any able and thoughtful man. Nay, we cannot but feel that in their form we observe the ill effects of the very apprenticeship that he believed to be the best early education for a medical man. We believe that a more systematic training in scientific method in his earlier days would have led not only to a chastening of such speculations, but also to the attainment of scientific discoveries of a more abiding value. Nevertheless, we put down this book with a sense that men of Richardson's stamp—courageous and unwearied in the pursuit of truth—are the salt of our race; and that even in the most unsubstantial of his musings there is always an elevation of tone which reveals the noble and humane character of one so long a familiar figure among us, but whose voice we shall hear no more. T. C. A.

## A NEW WORK ON POPULAR ASTRONOMY.

*The Concise Knowledge Astronomy.* By Agnes M. Clerke, A. Fowler, A.R.C.S., F.R.A.S., Demonstrator to the Royal College of Science; and J. Ellard Gore, F.R.A.S., M.R.I.A. With illustrations from photographs and drawings. Pp. x + 581. (London: Hutchinson and Co., 1898.)

THIS is a formidable array of authors, and the necessity for such a numerous combination is not at all clear. There is nothing in the book that any one of the three could not have written, and we might add that any one of the three could have written a better book, than the united efforts of the three have produced. While the separate parts, judged from a popular standpoint, are in many respects admirable, there is a want of cohesion in the whole, that is disappointing and unsatisfactory. Collaboration to be effective must be close and thorough; but here, facts are repeated by the separate authors in a way which annoys, and statements are divided between the different writers in a manner which disturbs, a reader. Efficient editing could have prevented a good deal of this overlapping, and have dovetailed the parts together with more skill; but the cumbrous machinery that necessitated an editor at all was a mistake. Can any one suppose that there is any material gain in taking the chapters on the sidereal universe out of Miss Clerke's hands and placing them in those of Mr. Gore, or that Mr. Fowler was incapable of describing the main features of the several members of the solar system? Judging from the result before us, an elementary book is not increased in accuracy nor benefited in arrangement by distributing the compilation among several authors.

Of the trinity here under consideration, Miss Clerke is the largest contributor. To her is entrusted the opening chapters, sketching the history of the science from Hipparchus to the present time. In her hands, a sketch, however brief, is sure to be well arranged and graphically written. We confess, however, to a little disappointment that more space is not given to the development of spectroscopy, and this remark applies not only here but throughout the book generally. Owing to considerations of space it might have been necessary to curtail, or even to exclude, all reference to Mohammedan, and possibly to pre-Newtonian science in these opening chapters; but this loss would have been more than compensated by impressing on the average reader the importance of astrophysics and the part it plays, and in the immediate future, will play, in the development of astronomical science. It must be, no doubt, always a difficult task to know what facts are to be suppressed, and to what others prominence must be given, in order to preserve in due perspective the salient features that mark the onward progress of a science. But full advantage has not been taken of the marvellously rapid development of astrophysics to make it an incentive to the study of astronomy. The facts, and possibly the speculations, of spectroscopy have a great fascination for the general reader. The results can be presented without reference to mathematical formulæ, and by the powerful appeal they make to the imagination, they are eminently calculated to excite public enthusiasm and arouse an intelligent

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interest in the community. Surely one of the objects, if not the main object of such a book as this, is to promote the cultivation of the science among an instructed, but not specially instructed, public. For whom else is the book written? It is not a work of reference intended to be used by the astronomer; it is not sufficiently full. The earnest student of astronomy is catered for by treatises of a more serious character. In point of fact the book occupies, to some extent, the ground which Sir Robert Ball has so well covered, and appeals generally to the same class of readers.

Another disadvantage springs from this slight, and Miss Clerke must pardon us if we say, unworthy, sketch of spectroscopic advance. Justice is not accorded to those who have worked strenuously and successfully as pioneers in this branch of science. One unacquainted with the history of the science might suppose that our knowledge of it began and ended with the work of Sir William Huggins. We do not mean to imply that there is one word here that is not justified by his great reputation, but only to regret that the names of other equally earnest and equally capable workers are suppressed. We think the omission of all reference to the work of other physicists, both at home and abroad, makes the survey of the general progress of the science too incomplete, and might indeed be likened to the representation of Hamlet with the omission of the Prince of Denmark. No doubt the prominence given to some astronomers, and the silence maintained with regard to others, are accidental; but it unfortunately suggests that the author's mind is warped in special directions, preventing a wholly unprejudiced survey being taken, and suggesting a biassed arrangement of the facts. Happily, in such an elementary work, when we come to greater detail, points still open to controversy and further elucidation do not come before us. We have only to deal with admitted and recognised truths, and here Miss Clerke is a safe guide. The section describing the solar system leaves little to be desired; few could probably have arranged an equal number of facts in the same space without becoming dull and wearisome. By the admirable illustrations supplied, we are in some instances enabled to see the planets and the details of their surface markings as they are revealed in the most powerful telescopes, while the latest views and speculations of the observers are recorded with ample fulness. We anticipate that on this section the general reader will dwell with the greatest interest and delight.

Mr. Fowler's work, without much reason, is sandwiched in between the preliminary historical chapter and this description of the solar system. It is termed geometrical astronomy, not a very happy title, but spherical was, no doubt, felt to be too ambitious a description, and it certainly does deal with many of the problems that belong to the earth's figure and motions. Trigonometrical expressions are practically excluded, but by the aid of diagrams a good many simple problems are very satisfactorily explained. The description of instruments is an interesting feature in this section, and is written with that simplicity and clearness which characterises all Mr. Fowler's work when dealing with mechanical operations.

Mr. Gore furnishes the last part of this trilogy. His domain is the sidereal heavens, and, considering the space at his disposal, his work is very thoroughly done. We could have wished, and so possibly did Mr. Gore, that he had been allowed to use Greek letters to designate the stars in their respective constellations. An uncomfortable strange appearance is given to many old friends dressed up in this unfamiliar fashion. But when one gets over this peculiarity it will be found that the facts connected with binary systems, with temporary and variable stars, with the motion of the sun are clearly and accurately stated, and give a very complete idea of the present condition of our knowledge of the sidereal heavens.

A few very obvious errors are occasionally met with in the course of the book; but where so much has been read with pleasure, it seems a very ungracious task to place the finger on these few blots, which, no doubt, will disappear in subsequent editions. If any one prides himself on his accuracy, let him write an elementary textbook on a subject in which the facts are continually accumulating, and the deductions from them being constantly modified, and he will probably find that his self-complacency is scarcely warranted. W. E. P.

## OUR BOOK SHELF.

*Manuel d'analyse chimique appliquée a l'examen des produits industriels et commerciaux.* By Émile Fleurent. Pp. iii + 582. (Paris: G. Carré et C. Naud, 1898.)

THE author states in his preface that he has written with a threefold aim, namely: (1) to give general methods of qualitative and quantitative mineral analysis and organic analysis of an elementary character, free from all details not absolutely useful; (2) to avoid methods of work that are too long for those who are pressed for time or who have not sufficient general knowledge, giving in each case only one method (or occasionally two) that leads quickly and surely to the desired result; and (3) to bring together in one volume the methods of examination of *the more important*, though the most diverse of the products which one meets with in the laboratory of the industrial chemist. Accordingly we find in some 556 pages of clearly printed and well-spaced matter some preliminary observations with reference to apparatus, a section on qualitative analysis, and methods for the quantitative examination of the commoner metals and minerals containing them, besides, among other things, water, inorganic pigments, cements, &c., compounds of the alkalis, manures of various kinds, soils, animal and vegetable products, such as cellulose, tannin, milk, fruits, fermented liquors, wines, and textile fabrics, the estimation of acetone in methylated spirit, and the determination of the flashing point of petroleum, &c. It is obvious that where so much ground is covered in so comparatively small a space, that in some cases at least there cannot be room for more than a mere summary of the details of the method given. It is generally a matter of opinion as to which is the best of several alternative methods, and often, too, a slight variation in the sample from what is most usual, renders a variation in the process desirable. It must have been a very difficult task to select the one or two methods in each case; but, taken as a whole, they are fairly representative. If the space devoted to the figures of beakers and other apparatus, and to the exceedingly meagre description of the qualitative reactions of the common acids and bases had been devoted to an expansion of the other part of the book, the usefulness of the volume would have been much increased. We doubt, for example, the need for telling any one who concerns himself with such work as is here described, that

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